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Byron Station, Unit 2  
Facility Operating License No. NPF-66  
NRC Docket No. STN 50-455

Subject: Licensee Event Report 2012-001-00, "Manual Reactor Trip During Power Ascension Due to Steam Generator Level Approaching Turbine Trip Setpoint Caused by an Overly Complex Startup Procedure"

The enclosed Licensee Event Report (LER) is being submitted in accordance with 10 CFR 50.73, "Licensee event report system," paragraph (a)(2)(iv)(A). The LER involves a Unit 2 manual reactor trip and Auxiliary Feedwater system actuation.

There are no regulatory commitments contained in this letter. Should you have any questions concerning this submittal, please contact Mr. David Gudger, Regulatory Assurance Manager, at (815) 406-2800.

Respectfully,



Timothy J. Tulon  
Site Vice President  
Byron Station

Enclosure: LER Number 455-2012-001-00

**LICENSEE EVENT REPORT (LER)**(See reverse for required number of  
digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to [infocollects.resource@nrc.gov](mailto:infocollects.resource@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

**1. FACILITY NAME**

Byron Station, Unit 2

**2. DOCKET NUMBER**

05000455

**3. PAGE**

1 OF 3

**4. TITLE**

Manual Reactor Trip During Power Ascension Due to Steam Generator Level Approaching Turbine Trip Setpoint Caused by an Overly Complex Startup Procedure

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
02	06	2012	2012	- 001 - 01		04	06	2012	N/A	

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
	<input type="checkbox"/> 20.2201(b) <input checked="" type="checkbox"/> 20.2201(d) <input checked="" type="checkbox"/> 20.2203(a)(1) <input checked="" type="checkbox"/> 20.2203(a)(2)(i) <input checked="" type="checkbox"/> 20.2203(a)(2)(ii) <input checked="" type="checkbox"/> 20.2203(a)(2)(iii) <input type="checkbox"/> 20.2203(a)(2)(iv) <input checked="" type="checkbox"/> 20.2203(a)(2)(v) <input checked="" type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 20.2203(a)(3)(i) <input type="checkbox"/> 20.2203(a)(3)(ii) <input type="checkbox"/> 20.2203(a)(4) <input type="checkbox"/> 50.36(c)(1)(i)(A) <input type="checkbox"/> 50.36(c)(1)(ii)(A) <input type="checkbox"/> 50.36(c)(2) <input type="checkbox"/> 50.46(a)(3)(ii) <input type="checkbox"/> 50.73(a)(2)(i)(A) <input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(i)(C) <input type="checkbox"/> 50.73(a)(2)(ii)(A) <input type="checkbox"/> 50.73(a)(2)(ii)(B) <input type="checkbox"/> 50.73(a)(2)(iii) <input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A) <input type="checkbox"/> 50.73(a)(2)(v)(A) <input type="checkbox"/> 50.73(a)(2)(v)(B) <input type="checkbox"/> 50.73(a)(2)(v)(C) <input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 50.73(a)(2)(vii) <input type="checkbox"/> 50.73(a)(2)(viii)(A) <input type="checkbox"/> 50.73(a)(2)(viii)(B) <input type="checkbox"/> 50.73(a)(2)(ix)(A) <input type="checkbox"/> 50.73(a)(2)(x) <input type="checkbox"/> 73.71(a)(4) <input type="checkbox"/> 73.71(a)(5) <input type="checkbox"/> OTHER Specify in Abstract below or in NRC Form 366A
1				
10. POWER LEVEL				
025				

**12. LICENSEE CONTACT FOR THIS LER**

FACILITY NAME

David Gudger, Regulatory Assurance Manager

TELEPHONE NUMBER (Include Area Code)

(815) 406-2800

**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

**14. SUPPLEMENTAL REPORT EXPECTED**☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE)☒ NO**15. EXPECTED SUBMISSION DATE**

MONTH

DAY

YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

At approximately 1700 hours, on February 6, 2012, the Unit 2 Operating crew was in the process of conducting a unit startup in accordance with startup procedures. The reactor was at approximately 25 % power. During the step that switched Feedwater (FW) flow from the upper nozzle of the 2C Steam Generator (SG) to its lower nozzle via the 2C FW Isolation Valve (FWIV), the Reactor Operator controlling the SG levels manually was also focused on maintaining subcooling in the tempering line and satisfying water hammer interlocks. Consequently, the RO was not closely monitoring the 2C SG level increase. Another assisting RO recognized the level increase was approaching the high level setpoint and informed the RO. Subsequently, the RO reduced FW flow; however, the level continued to increase and approach the high level setpoint of 80.8% (i.e., P-14), which causes an automatic turbine trip and FW isolation. In anticipation of reaching this setpoint, the Unit 2 Senior RO directed a manual reactor trip at 1719 hours. Almost simultaneous to the manual reactor trip the 2C SG level reached the P-14 setpoint. The reactor trip signal and P-14 both generate an automatic turbine trip and FW isolation. The turbine tripped and FW isolated, as designed. In accordance with reactor trip response procedures, the 2A and 2B Auxiliary Feedwater pumps were started. The cause of the event was determined to be an overly complex startup procedure and weak Operating crew performance. The startup procedure will be revised and personnel performance issues were remediated.

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# NARRATIVE

## Description of Event

Event Date/Time: February 6, 2012 / 1719 hours

Unit 2 was in Mode 1 – Power Operation

The Unit 2 Reactor Coolant (RC) [AB] System was at normal operating temperature and pressure for 25% power. No structures, systems, or components were inoperable at the start of this event that contributed to the event. The 2C Feedwater (FW) [SJ] Isolation Valve (FWIV) was degraded due to mechanical binding issues when opening. A warming blanket was installed on the valve to aid in stroking it open without binding.

At approximately 1700 hours, on February 6, 2012, the Unit 2 Operating crew was in the process of conducting a unit startup in accordance with startup procedures. At approximately 25% reactor power, the Reactor Operator (RO) responsible for Steam Generator (SG) FW flow and level control and the RO responsible for opening the FWIVs were ready to perform the steps that transfer FW flow from the Steam Generators (SGs) [SB] upper nozzles to the lower nozzles through the four FWIVs. The Unit 2 Senior Reactor Operator (SRO) was overseeing the evolution. To open the FWIVs, three water hammer prevention interlocks ensuring adequate FW flow and temperature needed to be satisfied. The startup procedure has the FW Regulating Valves (FRVs) in manual control for this evolution. Additionally, the 2C FWIV was to be the first valve to open due to issues with it potentially binding.

At the start of the evolution, the SG RO was focused on maintaining subcooling in the 2C FW tempering line by opening the 2C FRV and providing more FW through the line. The SG RO was also concerned with satisfying the water hammer prevention flow and temperature interlocks. The FWIV RO began opening the 2C FWIV and the 2C SG level began to rise as expected. As the 2C FWIV was opening, the SG RO continued to focus on maintaining subcooling and satisfying the waterhammer prevention interlocks and not closely monitoring the 2C SG level increase. During this time, the Unit 2 SRO was focused on the proper performance of the 2C FWIV due to its degraded condition and not maintaining proper oversight of the overall evolution.

Another RO, assisting in the startup, noticed and communicated to the SG RO and Unit 2 SRO that the 2C SG level was above 70% and rapidly rising. The SG RO reduced FW flow to the 2C SG; however, the level continued to increase and approach the high level setpoint of 80.8% (i.e., P-14), which causes an automatic turbine trip and FW isolation. In anticipation of reaching this setpoint, the Unit 2 SRO directed a manual reactor trip at 1719 hours. Almost simultaneous to the manual reactor trip, the 2C SG level reached the P-14 setpoint. The reactor trip signal and P-14 both generate an automatic turbine trip and FW isolation signal. The turbine tripped and FW isolated, as designed. The Operating crew responded to the reactor trip using appropriate emergency procedures. At 1734 hours, in accordance with reactor trip response procedures, the 2A and 2B Auxiliary Feedwater (AF) [BA] pumps were manually started to provide water to the SGs. The AF pumps operated as expected and were secured at 1954 hours and 2037 hours for the 2A AF and 2B AF pumps, respectively. Unit 2 remained stable in Mode 3 pending post reactor trip event review.

An Emergency Notification System notification was made to the NRC in accordance with 10 CFR 50.72 (b)(2)(iv)(B) and (b)(3)(iv)(A). In addition, an LER is required to be submitted in accordance with 10 CFR 50.73 (a)(2)(iv)(A).

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#### A. Cause of the Event

The root cause was determined to be an overly complex procedure requiring the FRVs to be in manual control during this point in the reactor startup process. Coordination of the opening of the FRVs and FWIVs, while the SG RO was reacting to other issues such as maintaining subcooling in the tempering lines and satisfying water hammer prevention interlocks, became overly distracting and led to the 2C FRV to be opened to far. A benchmark of the Braidwood Station startup procedure indicates having the FRVs in automatic control at this point in the startup is less complex and a more effective means to perform this evolution.

Contributing causes include:

Inadequate personnel performance issues by the licensed operators involved in the event.

Distraction created by the degraded 2C FWIV.

Less than adequate Operations crew teamwork performance during the evolution.

Lack of Unit 2 specific SG level control simulator modeling. The Unit 1 and Unit 2 SGs are different models and have different level setpoints and level control. The site simulator is modeled after the Unit 1 configuration. Consequently, Operators do not receive simulator experience controlling the Unit 2 SG level.

#### B. Safety Significance

There were no safety consequences impacting plant or public safety as a result of this event. The reactor trip system, P-14, and the AF system functioned as designed. A risk analysis also indicates this event was not risk significant.

#### C. Corrective Actions

The Unit startup procedure will be revised to have the FRVs in automatic control during the opening of the FWIVs.

Other shutdown and startup procedures will be reviewed against Braidwood Station's corresponding procedures to ensure the sites are aligned to the best practices.

The priority of repair for the 2C FWIV will be reassessed.

Performance weaknesses with the operators involved have been remediated.

To correct the crew teamwork performance, enhanced pre-planned organizational responses are being developed and will be deployed when operating personnel performance issues warrant intervention.

The simulator's design will be reviewed to determine if the Unit 2 SG level control should be modeled.

#### E. Previous Occurrences

LER 455 2010-001-00, "Reactor Protection and Auxiliary Feedwater System Actuation Signals from Low Steam Generator Level Due to Inadequate Surveillance Testing," dated April 19, 2010 Some personnel performance issues in this event were similar to this previous event. Beyond crew remediation for this event, management oversight and corrective actions to address crew team performance should maintain future high standards in individual and crew performance